25: Cameron--39 (1913-18) 1923 Copper Eskimo
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"GENERAL DESCRIPTION OF THE CRANIA

'Eleven male and fifteen female crania were available for study, the others being so fragmentary that it was impossible to make any measurements on them. It was decided to compare the present series with the Eskimo crania in the Royal College of Surgeons Museum, London, and this proved a most profitable venture. At the same time the crania have been contrasted with those of various other races, very distant and divergent in type. In this way many facts of striking significance have been elicited. It was decided to discuss the results for the male and female crania separately as sex exerted strong influence upon the indices, particularly the orbital.

Some of the skulls had been bleached to an almost dazzling white colour from prolonged exposure to alternating periods of rain and sunshine during the summer months. The outer table of bone showed in many cases various degrees of erosion from the persistent effects of the above agencies. The characteristic keel-shape of the cranial vault in the line of the sagittal suture, which is a frequent feature of the Eskimo skull, was visible only in eight of the male crania. None of the female skulls exhibited it."

"The mastoid processes and other points of muscle attachment, such as the occipital curved lines, crest and protuberance, were strongly developed in the male crania, showing that the individuals had led very active lives. The great feature of the Eskimo skull, however, is the extent of the areas of attachment of the masticatory group of muscles. Thus the temporal lines were well marked and situated high up on the sides of the cranium, in this way reducing the stephano-zygomatic index very markedly in some of the crania. For example the latter index fell to 58.1 in one male skull and to 64.5 in one female cranium. These represent the lowest ebb for this index, so far as the writer can ascertain."

The zygomatic arches of the Eskimo skull form obstrusive bars of bone for attachment of their powerful masseteric muscles. The lateral projection of these arches constitute a striking feature of the skull when it is examined from below. The result is that the spaces that are left for the passage downwards of the temporal muscles are amazingly large (see Fig. 4), thus indicating that these muscles must attain to a very robust degree of development. The writer conceived the idea of taking measurements of the lower end of the temporal fossa, that is to say from the inner surface of the zygoma to the infra-temporal crest on the great wing of the sphenoid. This gap proved to be as much as 29mm. in one male skull and 27 mm. in one female skull, these distances being far greater than in the average type of European cranium and likewise greater than in two low grade Melanesian skulls recorded by the writer, (4) where the corresponding

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Nova Scotia Institute of Science, Vol. 14, Part 4, Halifax, 1918.

dimensions proved to be 25. 5mm. It was therefore evident that the temporal muscles must have been massively developed in order to fill up these unusually wide spaces. Again, the external pterygoid plates were exceptionally wide--as much as 20 mm. in

one female skull (XIV F-16), while the tuberosity of the palate bone exhibited a greater degree of prominence than usual, bothfacts indicating of course that the external and internal pterygoid muscles were strongly developed and vigorous in their actions. In many cases the posterior border of the external pterygoid plate was pulled backwards into slender prolongations, produced obviously by the persistent traction of the external pterygoid muscle. The abnormal size of the external pterygoid plates of the Eskimo skull, together with their significance has been already pointed out by Brierley and Parsons. (2).

2. Brierley, J., and Parsons, F.G. Notes on a Collection of Ancient Eskimo Skulls. Journal of the Royal Anthropological Institute, Vol. XXXVI, London, 1906."

25: Cameron--40 (1913-18) 1923 Copper Eskimo
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"The zygomatic arches displayed some points of interest. Their architecture was more massive when compared with the average European male or female type. They were, moreover, more markedly curved outwards. The writer was, however, much impressed by the relatively feeble degree of development of the tubercle at the root of the zygoma for the attachment of the external lateral ligament of the lower jaw. This tubercle was so poorly developed in all thirty skulls that were available for its study, that the writer was inclinde to believe it to constitute a definite racial character, which would certainly indicate a comparatively feeble degree of development of the external lateral ligament of the lower jaw. The latter band is a strongly pronounced structure in the Anglo-Saxon race, where it is associated with a correspondingly prominent tubercle. The zygomatic arch, owing to its marked projection, presented an unusually extensive lower border and inner surface for the origin of the powerful masseter muscle. The buttress of bone projecting from the superior maxilla for the support of the anterior end of the zygoma was very prominently displayed, no doubt to resist the strong downward pull of the masseter muscle upon the zygomatic arch during mastication (see Plate 2)."

"The glenoid fossae were remarkably shallow, and were thus in marked contrast to the depth found in the average type of Anglo-Saxon skull. This condition has been already emphasized by Knowles. (14) This observer rightly pointed out that this shallowness was

14. Knowles, Sir Francis H.S. The Glenoid Fossa in the Skull of the Eskimo. Geological Survey of Canada, Museum Bulletin No. 9, Anthropological Series No. 4. Ottawa, 1915.

due to the free lateral movements of the molar groups of teeth in masticating tough uncooked food. Indeed, it is probable that the shallowness of the glenoid fossae and the almost total abolition of the tubercle at the root of the zygoma, recorded in the preceding paragraph, may be concomitant phenomena, for it is evident that the capsule of the temporo-mandibular joint of the Eskimo skull would have to be very lax to admit of his vigorous trituration movements. In the Anglo-Saxon race, on the other hand, we meet with a totally different type of mastication (associated with well-cooked food and social convention) which has resulted in a certain degree of limitation in the movements of the mandibular condyles, due to strongly developed external lateral ligaments and a deep glenoid fossa."

"The lambdoidal and the posterior halves of the sagittal sutures exhibited as a rule a considerable degree of complexity and tortuosity. Wormian bones of an irregular type were frequent along the line of the lambdoidal suture, including two large triangular ones, symmetrical in shape and arrangement, in the case of cranium XIV F-24. These evidently represented portions of the inter-parietal bone (see Plate 8).

The crania exhibited no grooves for the supra-orbital vessels and nerves, which according to the researches of Dixon, (9) are rather rare in the Eskimo skull. Strangely

9. Dixon, A. F. Journal of Anatomy and Physiology, Vol. XXXVIII, London.

enough, an Eskimo cranium in the possession of the writer, that came from Southampton island, Hudson bay, exhibits these grooves in the most marked degree. There were no metopic sutures and no fronto-squamous articulations.

The upper portions of the occipital bones exhibited a pronounced backward bulging so that the most posterior points of the crania were about midway between the lambda and the inion. There was nothing special to record regarding the thickness of the cranial wall.

The frontal, ethmoidal and sphenoidal sinuses were well developed, while the capacity of the maxillary antrum was certainly greater than in the European type of skull."

25: Cameron--40-41 (1913-18) 1923 Copper Eskimo
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"The foramina for emissary veins exhibited the usual vagaries of position and occurrence, as in the European skull.

The facial portions of the crania exhibited the broad flattened appearance so characteristic of the Eskimo, with prominently developed malar bones. It is of interest to compare the latter with those of the European type of skull, in which they are directed for the most part outwards. In these Eskimo crania, [41] on the other hand, they looked much more in a forward direction, and thus assisted in imparting the broadened appearance to the face. The flattened morma frontalis was, however, due in great measure also to the shallow character of the canine fassae of the superior maxillae, the result, of which was to cause the infraorbital foramina to look as much forwards as downwards (see Plate 2).

The malar bones appeared to be relatively larger than in the Anglo-Saxon type of skull. The tubercles on their posterior borders for the attachment of the temporal fasciae were much exaggerated, and presented the appearance of having been deliberately pulled backwards into salient projections by the traction of the above fasciae (see Plate 3)."

25: Cameron--41 (1913-18) 1923 Copper Eskimo
116, 141

"The superior maxillae were relatively larger than in the Anglo-Saxon type of skull and their facial surfaces were both broader and flatter. The buttress of bone that extends downwards externally towards the first molar tooth was most pronounced, and imparted to the face an appearance of breadth and massiveness. Another striking effect was produced by the ridges due to the sockets for the canine teeth, for these in the majority of cases were continuous with the outer margins of the nasal aperture (see Plate 2.)

In the Anglo-Saxon type of skull they are directed upwards and outwards external to this as a rule. The infraorbital suture connecting the floor of the orbit with the infraorbital canal was frequently present. This appears to be a feature of the Eskimo cranium.

The striking feature of the facial portion of the Eskimo cranium is the extreme reduction in the width of the nasal aperture. The latter exhibited a mimimum of 20 mm. in both the male and female crania. As a result, the nasal bones were also remarkably narrow, and indeed possessed only about half the width of those of the European type of skull. For example the distance between the outer borders of the nasal bones at their junctions with the frontal measured across the curve, was as short as 4 mm. in an adult male skull, whereas in the Anglo-Saxon type of skull the distance was found as a rule to be more than twice this amount. The extreme narrowness of the nasal bones was certainly a very pronounced feature of the crania (see Plate 2)."

"Subnasal prognathism was manifested by nine of the female crania, and accounted entirely for the high alveolar index of cranium XIV F-33B. This condition was exhibited only in two of the male crania, and that in a minor degree.

One remarkable feature shown by the crania was, that the nasal septum was situated in the mesial plane, and displayed no deflection whatever except in one skull. This is surely an indication of the correct use that the Eskimos make of their nasal fossae, as the proper channels for normal respiration.

A peculiar notching of the posterior edge of the foramen magnum is described as a frequent feature of the Eskimo skull. It was noted that ten of the crania displayed this condition."

25: Cameron--41-42 (1913-18) 1923 Copper Eskimo-1-2
116, 141

"The Cranial Capacity

This was measured in the usual way by means of small lead shot. The writer was greatly suprised at the results, which were in every instance well below the Eskimo average of 1546 c. cm. For example, the maximum capacity amongst the male crania was only 1450 c. cm. while the minimum reached the low level of 1290 c. cm. The female series was correspondingly bad--the highest capacity being 1340 c. cm. --an excessively low ebb. On comparing these results with the capacities of the Eskimo crania in the Royal College of Surgeons Museum (11) it was ascertained that the maximum and minimum

11. Flower, Sir William. Catalogue of the Royal College of Surgeon's Museum, 2nd Edition. London, 1907.

capacities of the male skulls in that collection were respectively 1730 and 1230 c. cm., and the maximum and minimum for the female crania 1510 and 1230 [42] c. cm. --a truly astounding comparison. One suggested explanation is that the crania of the latter collection were all from the Greenland area, and it may be that this Eskimo community possess a greater cranial capacity than that of the Central and Western Eskimos. To make matters worse, only four of the male crania went above 1400 c. cm., while only three of the female crania exceeded the 1300 level. The average for the whole collection

compared unfavourably with the capacities of two low grade Melanesian skulls recorded by the writer (4) (1368 and 1395 c. cm.) and was certainly much below the capacity of a North American Indian skull (1495 c. cm.) recently reported by the writer. (1)

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Nova Scotia Institute of Science, Vol. 14, Part 4, Halifax, 1918.

1. Berry, J.A., and Robertson, A.W.D. The Place in Nature of the Tasmanian Aboriginal. Proceedings of the Royal Society of Edinburgh, Vols. 31 and 34, 1910 and 1913."

25: Cameron--42 (1913-18) 1923 Copper Eskimo-1-2
116, 141

"The Cranial Length

In the whole series the most posterior point of the skull was about midway between the lambda and the inion. The maximum and minimum lengths for the male crania were 196 and 178 mm., while the corresponding figures for the male Eskimo skulls of the R.C.S. Museum (11) were 208 and 175 mm. The maximum and minimum lengths for the

11. Flower, Sir William. Catalogue of the Royal College of Surgeon's Museum, 2nd Edition. London, 1907.

female crania were 186 and 166.5 mm. as compared with 190 and 169 mm. for the female Eskimo skulls of the R.C.S. Museum. The average for the male crania practically accorded with the average for 117 male Scottish skulls found by Turner (17) to be 186.6 mm.

17. Turner, Sir William. A Contribution to the Craniology of the People of Scotland. Transactions of the Royal Society of Edinburgh, Vol. 41, Part 3, 1903.

The Eskimo tends to be long-headed and it is therefore of interest to compare the above

cranial lengths with these of two very dolichocephalic Melanesian skulls (190 and 199 mm.) (4).

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Nova Scotia Institute of Science, Vol. 14, Part4, Halifax, 1918."

"The Maximum Cranial Breadth

This was measured over the parietal bones. It is essential to mention this fact, as a greater breadth was generally obtained over the temporals. The maximum and minimum for the male crania were 143 and 127 mm. which practically coincided with the figures for the male Eskimo skulls of the R.C.S. Museum (143 and 125 mm.) (11) The corresponding

11. Flower, Sir William. Catalogue of the Royal College of Surgeon's Museum, 2nd Edition. London, 1907.

results for the female crania were 138 and 120.5 mm.

The maximum breadth of the male crania was much below the average for 114 male Scottish skulls, (17) but on the other hand was much greater than that of the two

17. Turner, Sir William. A Contribution to the Craniology of the People of Scotland. Transactions of the Royal Society of Edinburgh, Vol. 41, Part 3, 1903.

dolichocephalic Melanesian skulls referred to above (122 and 128 mm.) (4)

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Institute of Science, Vol. 14, Part 4, Halifax, 1918."

"The Cephalic Index

This index varied from a maximum of 76.5 to a minimum of 67.9 in the case of the male crania and from 75.8 to 69.9 in the female. Thus practically all the skulls of both sexes belonged to the dolichocephalic class. The range of variation of this index was not so pronounced as in the Eskimo collection of the R.C.S. Museum (11) where it

11. Flower, Sir William. Catalogue of the Royal College of Surgeon's Museum, 2nd Edition. London. 1907.

was found to fluctuate between 78.7 and 66.1 --truly an extensive range. This all goes to exemplify the wide racial range of variation that characterises this index. Still, the general fact remains that the Eskimo skull is as a rule dolichocephalic, which is in marked contrast to the condition that prevails in the average Mongolian type of skull, since the latter tends to be located in the brachycepahlic or broadheaded class. Therefore it is evident if the Eskimos do possess a Mongolian ancestry, then this must have been in byegone ages, in order to permit a lengthy period of segregation from his kinsmen, sufficient for ensuring the evolution of his own specialized form of skull. It is of interest therefore to compare his cephalic index with that of a Mongoloid type like the North American Indian, in whom, amongst the more westerly located tribes at any rate,

according to Hrdlicka's map, (20) [43] the broad headed type used to be fairly prominent.

20. Hrdlicka, A. Physical Anthropology of the Lenapes of Delawares and of the Eastern Indians in General. Bulletin 62, Bureau of American Ethnology, Washington, 1915.

The North American Indians of Canada and Newfoundland would of course be the Eskimos' nearest neighbours, but unfortunately an insufficient number of these crania has been examined to inform us definitely what the cephalic index of the aborigines of Canada actually was. However, it may be noted that the cephalic index of a Micmac Indian skull recently recorded by the writer (5) was 80.8, while Prest (15) many years ago reported

5. Cameron, J. A Craniometric Study of the Micmac Skull in the Provincial Museum of Nova Scotia. Transactions of the Nova Scotia Institute of Science, Vol. 15, Part 1, Halifax, 1919.

15. Prest, W.H. Measurements of Two Beothuck Skulls in the Museum, St. Johns, Newfoundland. Proceedings of the Novia Scotia Institute of Science, Vol. 9, Part 3. Halifax, 1897.

In spite of these observations it is essential to mention that the cephalic index taken by itself is no standard of intellectual omniscience. Thus the average cephalic index for the Anglo-Saxon race is 76.1, which is therefore just above the dolichocephalic class."

the indices of two aboriginal Beothuck skulls from Newfoundland as 78.4 and 80.2. It is clear that these isolated examples, at any rate, demonstrate a wide gulf between the North American Indian and the average Eskimo type of cephalic index."

"It is interesting to compare the cephalic index of these Eskimo crania with that of the two Melanesian skulls already referred to. (4) In these it had sunk to the low figure of

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Institute of Science, Vol. 14, Part4, Halifax, 1918."

64. This leads one to mention that in the negro races, including those with the most primitive cerebal organizations, dolichocephaly is certainly the predominant type. Moreover, it is the condition found in some of the extinct races of mankind such as Neanderthal man (cephalic index 73. 9) (16) and Cromagnon man (cephalic index 73. 3) (13)

16. Schwalbe, G. Der Neanderthalschädel. Bonner Jahrbücher, Heft 106, 1901.

13. Klaatsch, H. Die Fortschritte der Lehre von den fossilen Knochenresten des Menschen in den Jahren 1900-1903. Ergebnisse der Anatomie und Entwickelungsgeschichte, Vol. 12, 1903.

"The Index of Cranial Height

The maximum and minimum for this index were found to be 76.9 and 69 in the case of the male crania and 78.5 and 68.4 in the female crania. The average was about the same as that for the Eskimo collection in the R.C.S. Museum (11) which was estimated by

11. Flower, Sir William. Catalogue of the Royal College of Surgeon's Museum, 2nd Edition. London. 1907.

Flower to be 73.7. Therefore, it is evident that this index closely follows the cephalic index, the obvious inference being that races which are long-headed are also low-headed. As an extreme illustration of this fact the writer would again like to cite the two extremely dolichocephalic Melanesian skulls, (4) where the corresponding indices of cranial

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Institute of Science, Vol. 14, Part4, Halifax, 1918.

height reached the consistently low levels of 68 and 65."

25: Cameron--43 [3] (1913-18) 1923 Copper Eskimo
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"The Breadth-Height Index

It is surprising to note how little this cranial index has been exploited by anthropologists. In the male crania this index was found to fluctuate between 109.3 and 94.5, and in the female crania from 103.8 to 93.4, with an average of well over 100, particularly in the male series. This meant of course that the height was a little greater than the maximum breadth. Turner (17) pointed out some years ago that in a dolichocephalic

17. Turner, Sir William. A Contribution to the Craniology of the People of Scotland. Transactions of the Royal Society of Edinburgh, Vol. 41, Part 3, 1903.

skull the height was usually a little greater than the maximum breadth. That fact was certainly exemplified in this series of crania. It may be added that the converse usually holds true for brachycephalic skulls, and was well exemplified in a Micmac North American Indian skull recently described by the writer, (5) where the height was found to be

5. Cameron, J. A Craniometric Study of the Micmac Skull in the Provincial Museum of Nova Scotia. Transactions of the Nova Scotia Institute of Science, Vol. 15, Part 1, Halifax, 1919.

decidedly less than the breadth (with an index of 90.5)."

"The Alveolar or Gnathic Index

"This important index was found to vary from 93.3 to 100 in the male crania and from 88.9 to 107.4 in the female series, the latter fluctuations being most unusual. It may be again noted, nowever, that prognathism did not exist at all in the male crania, and, moreover, was entirely of the subnasal variety in the female crania that exhibited it (nine in number). It may be observed that some of the crania were remarkably orthognathous. It is evident, however, [44] that the alveolar index varies greatly in the Eskimo race, for Flower (11) records a male skull with an index as high as 107, and another

11. Flower, Sir William. Catalogue of the Royal College of Surgeon's Museum, 2nd Edition. London. 1907.

as low as 94. This observer gave the Eskimo average (for 24 unsexed skulls) as 100.6, thus placing the race in the mesognathous group. It may prove of interest to note further that Flower (11) found the average Mongolian index (for 17 Chinese skulls) to be 99, which approximated closely to the Eskimo average. For purposes of comparison it is worthy of mention that the Anglo-Saxon average index as given by Flower, is 95.6. (11)"

"The Nasal Index

The narrowness of the anterior nasal aperture of the Eskimo skull is one of its most salient features, the width in the present series varying from 20 to 27 mm. in the female crania and from 20 to 26 mm. in the male crania. As a result the nasal index is usually low, the maximum and minimum being 52. 9 and 36. 4 for the female skulls, and 47. 2 and 35. 9 in the male series. The female cranium that recorded the index of 52. 9 must be regarded as most exceptional, as no other skull exhibited an index higher than 47. Even then, the average for the whole series was practically the same as that given by Flower for the Eskimo collection in the R. C. S Museum, viz., 43. 7. The crania were thus leptorrhine, and made a striking comparison with a Melanesian skull, where this index was found by the writer (4) to be 54. 9, indicating, of course, that the nasal aperture of

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Institute of Science, Vol. 15, Part 1, Halifax, 1919.

the skull was comparatively wide in the negro races. It is also interesting to compare the nasal index of the present specimens with that of the Mongolian (Chinese) type of skull, the average index for which was given by Flower (11) as 49. 8. It is, therefore,

11. Flower, Sir William. Catalogue of the Royal College of Surgeon's Museum, 2nd Edition. London. 1907.

evident that if the Eskimo did possess a Mongolian ancestry, then he has developed during the ages a very specialized form of nasal aperture. This is probably a provision of nature for a special type of respiration, associated with the inhalation of air reduced to a very low temperature. The converse certainly seems to be true, for the natural habitat of the negro, with his much widened cranial nasal aperture, is in a warm climate. It would thus prove an interesting investigation to ascertain whether his migration to more temperate zones is appreciably affecting his nasal width. Perhaps it is worthy of mention that the average nasal index for the Anglo-Saxon race is 46, which is comparatively low, the suggestive comment in this case being, that the race has become habituated to a climate which is bleak and cold at certain seasons of the year, not only in the British Isles, but also in our Canadian latitudes."

"The Nasion-Prosthion Height Index

This is a new index which has suggested itself to the writer. He can certainly find no reference to its previous use by anthropologists. The idea involved in its application is to compare the nasal width with the nasion-prosthion height. Of course, it could not possibly displace the very trustworthy nasal index, but it might be utilized as a supplement to the latter, which it follows more or less consistently. Thus the minimum and maximum for the male skulls were 22.4 and 36.2, with an average of 29.4, and for the female skulls 26.5 and 38.7, with an average of 31.2.

The Orbital Index

This has been found to be a rather variable and uncertain index throughout modern Hominidae, but it may be noted that the unsatisfactory results yielded by it are due, in some measure at least, to the circumstances that the important factors of age and sex were not excluded in the investigations. There can be no doubt that the orbital contour is different in early life from what it is in the [45] adult, and it also exhibits a difference in male and female crania of the same race, the index being somewhat higher in the latter sex. If these two factors be rigorously excluded then the index will be found to display a few consistent features. For instance, it is persistently high in all the Mongoloid races, and is lowest in the negro, with the European races occupying an intermediate position. It was, therefore, not surprising to find that the orbital index in these

crania was high, recording an average of 92 in the female and 88 in the male series, thus betraying a Mongoloid affinity. As a comparison with this it was noted that the average for 24 unsexed Eskimo skulls in the R.C.S. Museum (11) was 89, thus placing

11. Flower, Sir William. Catalogue of the Royal College of Surgeon's Museum, 2nd Edition. London, 1907.

the race definitely in the megaseme category. In contrast with this, the average for 208 European crania, as given in the catalogue of the R.C.S. Museum (11) was 87, which located them in the mesoseme group. Compare these again with the index in a Micmac North American Indian skull, recently recorded by the author as 88, (5) with the

5. Cameron, J. A Craniometric Study of the Micmac Skull in the Provincial Museum of Nova Scotia. Transactions of the Nova Scotia Institute of Science, Vol. 15, Part 1, Halifax, 1919.

Mongolian (Chinese) average of 89, (11) and with the Polynesian average of 91. (10). It is

therefore, evident that the height of the orbital aperture is consistently greater in the Mongoloid races than in the European.

The writer has recently shown (8) that 'the generalized form of orbital aperture in the

8. Cameron, J. Contour of the Orbital Aperture in Modern and Fossil Man. American Journal of Physical Anthropology, Vol. 3, No. 4, Menasha, Wisconsin, 1921.

adult male skull of modern races is represented by a quadrangular contour, individual variations of outline depending upon the degree of 'rounding off' of the four angles.'"

25: Cameron--45 (1913-18) 1923 Copper Eskimo
116, 141

"The Maxillo-Facial Index

Long-headed races are also long-faced as a rule. That is to say, the maxillo-facial height is more than half the interzygomatic breadth. This series of crania closely adhered to the above rule. For example this index was over 50 in all the male crania, with a maximum of 60.8. In the female crania only two indices sank below 50, and the maximum was 59.7. This conclusion is of interest when compared with the Mongolian type of skull which is usually both brachycephalic and brachyfacial. Again, the brachycephalic skull of a North American Indian (Micmac tribe) (5) was also found to be brachyfacial,

5. Cameron, J. A Craniometric Study of the Micmac Skull in the Provincial Museum of Nova Scotia. Transactions of the Nova Scotia Institute of Science. Vol. 15, Part 1, Halifax, 1919.

so that it consistently followed the Mongoloid type. The striking fact about this index in the Eskimo therefore is, that though he gives one the impression of being broad-faced in the living condition, his skull is really dolicho-facial."

"The Stephano-Zygomatic Index

This index provided a great surprise in these crania. For example, Duckworth (10)

10. Duckworth, L. W. H. Morphology and Anthropology. Cambridge, 1904.

states that the Eskimo skull is cryptozygous. Of the present collection all were phaenozygous, some being excessively so--one male cranium registering an index as low as 58.1. The maximum for this index was 71.6 in the male series and 79.7 in the female group. These results provided a most striking comparison with the European type of cranium which usually registers an index in the vicinity of 90. During a recent study of two low grade Melanesian skulls from the New Hebrides, the wrtier considered that he had reached the lowest ebb for this index (4) with the figures 71 and 73. It was, therefore,

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Institute of Science, Vol. 14, Part 4, Halifax, 1918.

all the more surprising to find that half the skulls of this Eskimo series were under these

low levels. Yet, after all, one need not be unduly amazed at these results, for it has been already pointed out how highly placed on the sides of these skulls the temporal lines were found to be. In a race like the Eskimos, accustomed as they are to a most vigorous indeed, almost violent type of mastication, one certainly meets with conditions calculated to reduce the stephano-zygomatic index to the most marked degree. As a result it will evidently be necessary to reconsider our present views regarding this cranial index in the Eskimo race. [46]

In passing, it is interesting to watch the reduction of this index to zero in the anthropoid apes. In the gorilla for example, it is non-existent owing to the fusion of the temporal lines in the mesial plane of the cranial vault to form the prominent crest along the line of the sagittal suture that is so pronounced in this animal."

25: Cameron--46 (1913-18) 1923 Copper Eskimo
116, 141

"The Gonio-Zygomatic Index

This is an index that has been very little exploited by anthropologists, and therefore the data regarding it are rather scanty. The idea involved in its application is to compare the width between the angles of the mandible with the inter-zygomatic breadth. It may be noted that the Eskimo skull furnishes the highest known average for this index amongst modern Hominidae, and Duckworth (10) gives the average for the race as 82.5.

10. Duckworth, L. W. H. Morphology and Anthropology. Cambridge. 1904.

The average for these crania was 82.8 which practically accorded with the above result. It is worthy of mention that in only one skull did the index fall below 80, while the maximum was represented by 88.2."

the minimum post-orbital diameter was only 66. 4 p. c. of the maximum parietal breadth. One will appreciate how low an ebb this is, upon recollecting that the corresponding index for such a lowly evolved type as the Java clavaria (Pithecanthropus erectus) is 65. 4. (13)

13. Klaatsch, H. Die Fortschritte der Lehre von den fossilen Knochenresten des Menschen in den Jahren 1900-1903. Ergebnisse der Anatomie und Entwickelungsgeschichte, Vol. 12, 1903.

This remarkable post-orbital constriction is quite a feature of the Java calvaria, as well as of the crania of the anthropoid apes, when examined from above. Again, it was noted that ten of the female crania and six of the male crania possessed fronto-parietal indices of a lower grade than that of the primitive type of skull represented by Neanderthal man. To carry the comparison further it was ascertained that many of these Eskimo skulls compared unfavourably with the Melanesian type in regard to their fronto-parietal indices thus bringing them down to the level of one of the lowest types of living mankind."

"The Fronto-Parietal Index

This cranial index has been applied chiefly to the calvaria of fossil man, and has not been elaborated much in reference to the crania of modern Hominidae. Indeed, the writer appears to be the only observer who has utilized it to any large extent (4 5 & 6),

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Institute of Science, Vol. 14, Part4, Halifax, 1918.

5. Cameron, J. A Craniometric Study of the Micmac Skull in the Provincial Museum of Nova Scotia. Transactions of the Nova Scotia Institute of Science. Vol. 15, Part 1, Halifax, 1919.

6. Cameron, J. A Contribution to the Evolution and Morphology of the Human Skull. Transactions of the Royal Society of Canada, Series 3, Vol. 12, Ottawa, 1918.

though it is possible he may stand correction on that point. The index varied from 77.1 to 66.4 in the male crania, and from 75 to 67.9 in the female. Thus in one male skull

25: Cameron--46 [3] (1913-18) 1923 Copper Eskimo
116, 141

"On studying the crania of the higher types of modern Hominidae from above, it is found that there is a progressive attempt to fill out the general contour and more particularly to obliterate the post-orbital constriction as much as possible. The result is a gradual improvement in the fronto-parietal index which in the European type of skull approximates to 90.

There must be some subtle cause for the creation of this low fronto-parietal index, which places the Eskimo skull, in other respects a well-developed one, in a comparatively lowly position amongst modern Hominidae. The suggestion the writer would like to offer is that the Eskimo, owing to his characteristic dietary, has to commence his strenous masticatory habits at an early stage in life. The result is, that his skull becomes compressed laterally by his powerfully developed temporal muscles, while still in the pliable condition of childhood. The effect of this would be to create a marked post-orbital constriction, and this would provide the essential element for the reduction of his fronto-parietal index."

"The Index of Height of the Bregma above the Glabella-Inion Line

Owing to the fact that the crania could not be sectioned in the mesial plane, the three basal angles and the calvarial height index could not be calculated. As a substitute for the latter the writer devised the index which forms the subject of this paragraph. In estimating it, the perpendicular height of the bregma above the glabella-inion line was compared with the length of the latter. The glabella-inion length for each skull was first of all measured off on paper. The glabella-bregma and inion-bregma chords were then measured off with drawing compasses and of course the point of meeting of these chords gave the position of the bregma. A perpendicular line dropped from the latter on to the glabella-inion line then gave the bregmatic height drawn to scale. Its length was estimated, multiplied by a hundred, and divided by the glabella-inion length. The bregmatic height would of course be a little less than the calvarial height, and therefore it was not surprising to find that in this index the results, with one exception, were all under 50. The index of calvarial height, on the other hand, is always well over 50 in the higher races of modern mankind. In these Eskimo crania the bregmatic height index varied from 52.2 to 44.7 in the males and from 48.5 to 43.7 in the females. It will thus be observed that this index displays a very moderate degree of racial variation, when compared with the vagaries of some of the cranial indices.

It may be noted here that the height of the bregma above the glabella-inion line ranged from 92. 3 mm. to 80. 3 mm. in the male crania and from 87. 5 mm. to 70 mm. in the female."

25: Cameron--47 [2] (1913-18) 1923 Copper Eskimo
116, 141

"The Bregmatic Angle

This angular cranial measurement has only come into its own within recent years as a factor of prime importance and significance in craniology. It is utilised to demonstrate the degree of expansion of the frontal cranial arc. One usually finds the briefest descriptions in the textbooks regarding its exact method of application, and indeed, it appears to have been mainly used in the study of the calvaria of fossil man. Schwalbe (16)

16. Schwalbe, G. Der Neanderthalschädel. Bonner Jahrbücher, Heft 106, 1901.

was one of the pioneers in its utilization and took full advantage of its value in his classic duty of the Neanderthal calvaria. For the present research his plan of procedure was adopted, this being the angle included between the glabella-bergma and the glabella-inion lines."

In these Eskimo crania the bregmatic angle varied from 58.5° to 53.5° in the males and from 60° to 51.5° in the females. The male crania were thus within the range of variation for modern Hominidae, which is given by Duckworth (10) as from 66° to 53°,

10. Duckworth, L. W. H. Morphology and Anthropology. Cambridge. 1904.

while the female series sank slightly below this. It would thus be interesting to note the effect of sex upon this angle. The average of the bregmatic angle was 55.5° for the male crania and 54.2° for the female crania. The writer was surprised to find that the general average of these was practically the same as that found by Berry and Robertson (1) in a series of one hundred aboriginal Australian skulls, namely 54.7°, and slightly

1. Berry, J. A., and Robertson, A. W. D. The Place in Nature of the Tasmanian Aboriginal. Proceedings of the Royal Society of Edinburgh, Vols. 31 and 34, 1910 and 1913.

lower than the average obtained by the same observers in forty-five aboriginal Tasmanian skulls (namely 56°). Moreover, the average for these Eskimo skulls compared unfavourably with the results obtained by the writer (4) in two low type Melanesian skulls

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Institute of Science, Vol. 14, Part 4, Halifax 1918.

(55^{o} and 59^{o}), and also with that of a Micmac North American Indian skull (60^{o}) recently recorded by the writer. (5) Indeed the Eskimo average was comparable to that of a

5. Cameron, J. A Craniometric Study of the Micmac Skull in the Provincial Museum of Nova Scotia. Transactions of the Nova Scotia Institute of Science. Vol. 15, Part 1, Halifax, 1919.

fossil type like the Cro-magnon (13) cranium (with a bregmatic angle of 54^{o}).

13. Klaatsch, H. Die Fortschritte der Lehre von den fossilen Knochenresten des Menschen in den Jahren 1900-1903. Ergebnisse der Anatomie und Entwickelungsgeschichte, Vol. 12, 1903."

25: Cameron--48 (1913-18) 1923 Copper Eskimo
116, 141

"The Palato-Maxillary Index

This index displayed a vast range of variation in these crania--from 132.1 to 105.8 in the male, and from 133.3 to 113.5 in the female. It is therefore clear that, if one adopts Turner's (18) classification, it will be noted that the male crania exhibited all the phases

18. Turner, Sir William. Report on the Bones of the Human Skeleton. Challenger Reports, Vol. 16, Part 47. London, 1886.

from an extreme brachyuranic to an extreme dolichouranic condition, while the female skulls ranged from an extreme brachyuranic to a mesuranic condition. This index certainly requires a little further exploiting in all races of mankind before its significance can be fully appreciated. However, all that can be stated with certainty at present is, that it appears to possess an amazing range of variation even in the higher races, for Turner (17) found the extreme limits of its fluctuations in his extensive series of Scottish

17. Turner, Sir William. A Contribution to the Craniology of the People of Scotland. Transactions of the Royal Society of Edinburgh. Vol. 41, Part 3, 1903.

crania."

25: Cameron--48 [2] (1913-18) 1923 Copper Eskimo
116, 141

"The Cranial Chords

The writer, with the literature at his disposal, can find no record of the cranial chords having been previously measured in the Eskimo skull, so that it will be of interest to study these in this race and compare them with the corresponding measurements for other races.

As the crania could not be sectioned mesially, it was impossible to calculate the important cranial curvatures."

"The Glabella-Bregma Chord

This cranial chord varied from 111.5 mm. to a minimum of 97 mm. in the male crania and from 109.5 mm. to 88mm. in the female series. The male and female averages proved to be 106.7 and 101.5 mm. These are well below the average of 112.5 mm. for the European type of skull, as given by Berry and Robertson, (1) and are almost comparable

1. Berry, J. A., and Robertson, A.W.D. The Place in Nature of the Tasmanian Aboriginal. Proceedings of the Royal Society of Edinburgh. Vols. 31 and 34, 1910 and 1913.

to the average (105.2 mm.) for the aboriginal Tasmanian unsexed skull as given by Büchner (3) and certainly below the average of 108 mm. for the aboriginal Australian

3. Buchner, L.W.G. A Study of the Aboriginal Tasmanian Cranium. Proceedings of the Royal Society of Edinburgh, Vol. 34, 1913-1914.

skull (unsexed), furnished by the same observer. These results may be further compared with 108 mm. in the Neanderthal type of skull, (16) 93 mm. in Pithecanthropus, (13)

16. Schwalbe, G. Der Neanderthalschädel. Bonner Jahrbücher, Heft 106, 1901.

13. Klaatsch, H. Die Fortschritte der Lehre von den fossilen Knochenresten des Menschen in den Jahren 1900-1903. Ergebnisse der Asatomie und Entwickelungsgeschichte, Vol. 12, 1903.

and 87 mm. in the Anthropoid ape. The writer was much struck by the length of the glabella-bregma chords in two low grade Melanesian skulls recently described by him (111.5 and 113.5 mm.) (4)

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Institute of Science, Vol. 14, Part 4, Halifax 1918."

"The Glabella-Lambda Chord

The writer can find few recorded measurements of this chord which may, however, prove to become a factor of some significance in craniometry. He therefore decided to publish the results of his calculations, in the hope that they may be of service as a means of comparison with other racial types. This cranial chord varied from 186 to 170.5 mm. in the male skulls, with an average of 178.6 mm., and in the female series from 178 to 156 mm., with an average of 169.8 mm. It is, therefore, evident that it displayed the racial range of variation which is characteristic of all cranial indices and measurements. These Eskimo averages could be compared with that (178.6 mm.) for one hundred aboriginal Australian crania (unsexed) and with that (173.2 mm.) for forty-eight aboriginal Tasmanian skulls (unsexed). (3) A further comparison might be made with the Neanderthal

3. Buchner, L.W.G. A Study of the Aboriginal Tasmanian Cranium. Proceedings of the Royal Society of Edinburgh, Vol. 34, 1913-1914.

type of skull (185.3 mm.) (16) and with Pithecanthropus (171 mm.) (13).

16. Schwalbe, G. Der Neanderthalschädel. Bonner Jahrbücher, Heft 106, 1901.

13. Klaatsch, H. Die Fortschritte der Lehre von den fossilen Knochenresten des Menschen in den Jahren 1900-1903. Ergebnisse der Anatomie und Entwickelungsgeschichte, Vol. 12, 1903."

25: Cameron--499 (1913-18) 1923 Copper Eskimo
116, 141

"The Bregma-Lambda Chord

This cranial chord fluctuated between a maximum of 114.5 mm. and a minimum of 104 mm. in the male skulls with an average of 108.7 mm. In the female series the range of variation was from 118 mm. to 94 mm. with an average of 104.4 mm.

This chord thus consistently followed the glabella-bregma chord, in being well below the European average of 112 mm. (as given by Büchner) (3) and also lower than the

3. Buchner, LW.G. A Study of the Aboriginal Tasmanian Cranium. Proceedings of the Royal Society of Edinburgh, Vol. 34, 1913-1914.

averages for aboriginal Australian and Tasmanian crania (114.7 and 113 mm.) as calculated by the same observer. These Eskimo crania may likewise be compared with the average for the Neanderthal type of skull (112 mm.) (16) and with Pithecanthropus (93 mm.) (13)

16. Schwalbe, G. Der Neanderthalschädel. Bonner Jahrbücher, Heft 106, 1901.

13. Klaatsch, H. Die Fortschritte der Lehre von den fossilen Knochenresten des Menschen in den Hahren 1900-1903. Ergebnisse der Anatomie und Entwickelungsgeschichte, Vol. 12, 1903."

25: Cameron--49 [2] (1913-18) 1923 Copper Eskimo
116, 141

"The Bregma-Inion Chord

So far as the writer can ascertain, no previous measurements of this chord appear to have been made. He has, however, recorded his results as a basis for comparison with other racial types in the future. It was found to vary from 158.5 mm. to 144 mm. in the male crania, with an average of 151.8 mm. and from 152 mm. to 127 mm. in the female skulls with an average of 141.7 mm. It was therefore evident that the usual racial range of variation manifested itself in regard to the measurements of this chord."

25: Cameron--49 [3] (1913-18) 1923 Copper Eskimo
116, 141

"The Lambda-Inion Chord

This chord varied between 80 mm. and 63 mm. in the male crania with an average of 69.4; and from 75 mm. to 55 mm. in the female series, with an average of 62. The results for the males were well above the European average of 63 mm., as given by Büchner, (3) and markedly above the averages for aboriginal Australian and Tasmanian

3. Buchner, L.W.G. A Study of the Aboriginal Tasmanian Cranium. Proceedings of the Royal Society of Edinburgh, Vol. 34, 1913-1914.

crania as given by the same observer (55.2 and 55.5 mm.). The average for the Neanderthal type of skull is 54 mm. (16) This chord in Pithecanthropus measured 42 mm. (13)

16. Schwalbe, G. Der Neanderthalschädel. Bonner Jahrbücher, Heft 106, 1901.

13. Klaatsch, H. Die Fortschritte der Lehre von den fossilen Knochenresten des Menschen in den Jahren 1900-1903. Ergebnisse der Anatomie und Entwickelungsgeschichte, Vol. 12, 1903."

"The Horizontal Cranial Circumference
This was measured over the glabella and the occipital point, as recommended by Turner. (18) It fluctuated between 551 and 505 mm. in the male crania, with an average

18. Turner, Sir William. Report on the Bones of the Human Skeleton. Challenger Reports, Vol. 16, Part 47. London, 1886.

of 524 mm.; and from 519 to 461 mm. in the female series, with an average of 492 mm. The average for the male skulls practically accorded with that (525 mm.) for the average European type of skull, also with the measurements for the male and female Eskimo crania 528 and 500 mm. in the R.C.S. Museum, (11) and even with the

11. Flower, Sir William. Catalogue of the Royal College of Surgeon's Museum, 2nd Edition. London. 1907.

corresponding dimensions of two low grade Melanesian skulls (520 mm. and 534 mm.), (4) As previously stated by the writer, (5) there is a very slight inter-racial range of

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Institute of Science, Vol. 14, Part4, Halifax

1918.

5. Cameron, J. A Craniometric Study of the Micmac Skull in the Provincial Museum of Nova Scotia. Transactions of the Nova Scotia Institute of Science, Vol. 15, Part 1, Halifax, 1919.

variation in this cranial measurement, even between the highest and lowest types of modern man, and on that account it would appear to lack significance. On the other hand, however, it emphasises the necessity for an expansion of the cranial roof in the higher races of mankind, in order to provide more accommodation for its cerebral contents that would prove commensurate with the more elaborate degree of evolution of the brain in these racial groups."

"The Naso-Orbito-Alveolar Index

The writer applied his recently devised naso-orbito-alveolar craniometric method (7)

7. Cameron, J. A New Craniometric Method. American Journal of Physical Anthropology, Vol. 3, No. 1, Menasha, Wisconsin, 1920.

to these skulls, and at the same time compared the results with those found in three other types of crania, as exhibited in Plate 1, where it may be noted that in the European, Eskimo and North American Indian types the height of each of the uppermost rectangles is greater than that of the two lower ones, which are approximately equal in height. These three crania thus conform to the writer's Eurasiatic type. In the Melanesian skull, on the other hand, the upper two rectangles are nearly equal in height, and are, moreover, approximately squares, while the lowest rectangle is excessively reduced in height owing to the extreme degree of prognathism of this cranium, which thus conformed to the writer's Negro type of naso-orbito-alveolar index. Moreover, the height of the upper horizontal dotted areas of the European, Eskimo and North American Indian crania is greater than those of the lower two, which are approximately equal in height. In the Negro type of skull, on the other hand, the two upper horizontal areas of the facial skeleton are seen to be approximately equal in height, while the vertical dimension of the lowest area is extremely reduced. The results of the measurements of

the various rectangles concerned in this index are given in the subjoined table.

In the following table there are four columns. The one to the left shows the relation of the width to the height of the whole rectangle (see Plates 6 and 7, Cat. No.'s XIV, H 4 and XIV, H 5). The other three columns give the corresponding results for the upper, middle and lower rectangles.

It will be observed that the results are slightly different in the two sexes, the average indices for all four columns being consistently higher in the female. It will be interesting to find if these results are upheld in a larger series of crania. [51] There was a marked reduction in the height of the lowermost rectangle in crania D-3 and F-31, and these vitiated the results to a considerable degree in the male and female series respectively. Otherwise the average for this rectangle would have been nearer 100. In a previous paper the author has pointed out that the middle and lowermost rectangles are approximately squares in the Eurasiatic type of cranium; that is to say, their indices are in the vicinity of 100. It will be noted from the table that the averages for these two rectangles in the present series of Eskimo skulls support this assertion.

Male crania	Whole rectangle	Upper rectangle	Middle rectangle	Lower rectangle
H- 4	25·0	62·7	81·8	81·5
H- 6	27·7	67·5	83·3	108·6
D- 3	36·2	86·0	100·0	160·8
F- 1	32·3	77·2	103·0	121·4
F- 2	34·4	75·6	129·1	124·0
F- 3	28·3	68·1	96·9	107·1
F-23	22·4	60·4	92·8	100·0
F-33A	29·1	71·4	93·7	103·4
Averages	29·4	71·1	97·5	113·1

Female crania	Whole rectangle	Upper rectangle	Middle rectangle	Lower rectangle
H-5	26·5	66·6	73·7	92·8
D-1	29·5	76·3	87·8	116·0
D-8	28·8	70·0	96·5	100·0
F-16	33·0	71·4	107·1	100·0
F-18	28·3	62·5	99·9	115·3
F-20	32·3	71·3	106·4	132·0
F-21	31·6	72·0	106·8	114·8
F-22	32·9	75·6	103·3	134·7
F-25	30·7	80·0	84·8	107·4
F-31	38·7	79·5	134·7	182·3
F-33B	34·5	85·2	120·8	96·6
F-33C	31·0	84·3	96·4	103·8
F-33D	28·3	68·1	88·2	111·1
Averages	31·2	74·0	100·0	115·8

"THE EVOLUTION OF THE ESKIMO TYPE OF SKULL

It is evident from the foregoing description that if the Eskimo is really Mongoloid in origin, which would bring him into relation with the Mongols of Asia, the Polynesians of the Pacific Ocean and the aboriginal Indians of the Western Hemisphere, then his skull exhibits at the present day some profound alterations from the generalised Mongolian type. Take first of all his contracted nasal aperture, which is perhaps his most important cranial specialisation, since it places the Eskimo skull in a category by itself. It will probably be granted by most observers that this modification can be explained by his climatic environment. The inhaling for prolonged periods of cold air, frequently registering many degrees below zero, would most assuredly compel nature to design and provide as narrow as aperture as possible, so as to reduce the chilling effect of this intensely low temperature to a minimum."

25: Cameron--51 [2] (1913-18) 1923 Copper Eskimo
116, 141

"Now, in reference to the dolichocephalic Eskimo skull, I do not personally consider that this has much significance when contrasted with the brachycephaly of the Mongol, for it is a well recognized fact that the cephalic index has quite an extensive range of variation, even in members of the same race. For example the average type of Scottish skull approximates to the dolichocephalic type, and yet Sir Wm. Turner found that 35 out of a series of 174 skulls collected from various parts of Scotland exhibited well-marked brachycephaly (17).

17. Turner, Sir William. A Contribution to the Craniology of the People of Scotland. Transactions of the Royal Society of Edinburgh, Vol. 41, Part 3, 1903."

25: Cameron--51-52 (1913-18) 1923 Copper Eskimo-1-3
116, 141

"The post-orbital construction in these Eskimo skulls is so marked that it deserves some comment. It has been already remarked that the temporal muscles must have been powerfully developed, judging from the extreme depth of the lower parts of the temporal fossae of these skulls. It seems to the writer that these strongly acting muscles might possibly have had a constricting effect upon this portion of the cranium, and thus diminished its post-orbital diameter. This conclusion is strengthened by a comparative study of the crania of some lower mammalia. In the gorilla, for example, the temporal muscles are huge, and meet in a sagittal crest on the cranial vertex. Their constricting effect is shown by the marked reduction of the post-orbital diameter, and of course by a pronounced lowering of the fronto-parietal index. This post-orbital constriction is, moreover, a striking feature of the crania of carnivora, the fronto-parietal index for the lion skull in the Nova Scotia Provincial Museum being found by the writer to be as low as 53, which meant that the post-orbital constriction was reduced to nearly one half of the maximum parietal breadth. On studying the conditions in modern Hominidae the author finds that the fronto-parietal index is usually above 80 in the Anglo-Saxon type of cranium, due of course to the fact that the skull has been compelled to adapt itself to the lateral expansion of the frontal lobes of the brain in these higher races. On the other hand he found this index as low as 72.6 in a Melanesian skull (4); while Duckworth

4. Cameron, J. Two Remarkable Skulls from the New Hebrides. Transactions of the Novia Scotia Insititute of Science, Vol. 14, Part 4, Halifax, 1918.

(10) gives the average index for the aboriginal Australian cranium as 77. There can be

10. Duckworth, L. W. H. Morphology and Anthropology. Cambridge, 1904.

no doubt that these lowly evolved types of modern man indulge in a very vigorous and unconventional type of mastication; thus encouraging their powerful temporal muscles to exert this constricting effect upon their skulls, and therefore lower their fronto-parietal indices. Note further, that [52] the staple dietary of the Eskimo consists of raw or only imperfectly cooked food, so that their type of mastication must likewise be not only excessively vigorous, but also excessively unconventional. From the foregoing remarks it has become increasingly evident that the traction of the muscles of mastication on the lateral aspects of the cranium must exert a far-reaching influence upon its modelling and configuration--an effect which is probably not yet fully appreciated. The author would therefore like to put forward the theory that the type of mastication adopted by the Eskimo in negotiating his tough food has contributed, in no small measure, its effect in

producing his characteristic type of cranium. This decision will however have to be confirmed by the examination of a much more extensive series of Eskimo crania, and this will require to be undertaken in the future, when the necessary facilities are obtainable. For this purpose the author would indeed be most grateful for the loan or presentation of crania belonging to this most interesting race."

25: Cameron--54 (1913-18) 1923 Copper Eskimo
116, 141

"Mandibles

One of the first features that impressed the writer was the general massiveness of these Eskimo mandibles.

All the muscle markings were most pronounced, thus providing a suggestive reminder of the masticatory vigour of these individuals. Only in a few instances had the teeth been missing at death, for the alveoli as a rule were deep and their walls healthy. The angles were markedly everted. Indeed, this eversion had in many cases involved also the lower halves of the rami, thus imparting a very broadened appearance to the jowls (Fig. 2). The writer was much surprised at the obtuseness of the angles, considering that none of the individuals represented ages much above middle life. For example the sizes varied from 128° to 122° in the adult males and from 130° to 121° in the adult females. Thus none of them approximated to 90°. The intergonial width was remarkably high, ranging from 128 mm. to 115.5 mm. in the adult males and from 114.5 mm. to 101.3 mm. in the adult females. These high figures were of course a natural result of the eversion of the angles. The highest intergonial measurement the writer could make in a collection of male European mandibles proved to be 111.3 mm. and this was well below the minimum for the male Eskimo series, as noted above."

25: Cameron--54 [2] (1913-18) 1923 Copper Eskimo
116, 141

"One of the striking features of these Eskimo mandibles was the marked lowering of the posterior ends of the alveolar borders. This was most pronounced when viewed from the side (Fig. 3). For example, in one adult male mandible the height at the symphysis was 47 mm. and this rapidly diminished in a posterior direction, until opposite the third molar tooth it was only 32.5 mm., representing a reduction of 31 per cent. This remarkable condition suggested to the author a new index for the mandible to which he has applied the term 'the index of height of the mandible in the molar region.' The height in front is measured from the ridge between the alveoli of the central incisor teeth to the lower border of the symphysis. The height posteriorly is taken from the inner edge of the alveolus of the third molar tooth to the lower border of the mandible. This measurement was always made on both right and left sides in these Eskimo mandibles, for it was ascertained that in only three cases did these heights agree on both sides. In the others there was always a slight difference, and in these, interestingly enough, the lowering was on the right side, except in two cases where it was on the left. This suggested of course that these Eskimos were accustomed to masticate more on the right side than on the left."

25: Cameron--54 [3] (1913-18) 1923 Copper Eskimo
116, 141

"This new index was obtained by multiplying the height at the third molar tooth by one hundred and dividing by the height at the symphysis. The result of course represented the percentage height of the molar region. This proved a profitable investigation, for it produced not only interesting but also consistent results. For example it was found that the index progressively diminished with age. This fact furnished an interesting side light on the masticatory habits of the Eskimo, for it demonstrated that the terrific pressure to which the teeth were subjected forced the lower molar series more and more downwards during the period between adolesence and middle life."

"On making a close analysis of this new index it was noted that the highest figure, namely 91.4, was recorded in the mandible of a young adolescent female. The minimum (62.1) was found in the mandible of an adult female. The writer compared these results with the corresponding indices for ten European mandibles, where the maximum was 94.1 and the minimum 76.1, showing of course that the masticatory activity, and therefore the downward pressure upon the lower molar series, were not nearly so evident in these types of mankind.

This forcing downwards of the molar sockets produced an excessive broadening of the posterior portions of these Eskimo mandibles. Thus the distance between the inner border of the alveolus of the third molar tooth to the point [55] on the external surface where the anterior border of the ramus joins the body was as much as 21.5 mm. in one adult male mandible, while the minimum (14.5 mm.) was found in an adolescent female. The corresponding maximum in a series of European mandibles was 18 mm. The general effect produced was to cause the sockets of the molar series to overhang the inner aspects of the mandibles to a pronounced degree. This feature of the Eskimo mandible has been already emphasized by Hrdlicka. (12) Indeed in some instances the bony thickening was

12. Hrdlicka, A. Contribution to the Anthropology of the Central and Smith Sound Eskimos. Anthropological Papers of the American Museum of

Natural History, Vol. V, Part II, New York, 1910.

excessive. For example, in mandible XIV H-8 the inward bulging of the bone was so marked that the transverse distance between the inner surfaces of the body opposite the first molars was reduced to 21.5 mm. This jaw had therefore an extraordinary appearance when viewed from below (see Fig. 5). The writer would regard these bulgings as bone buttresses built up by nature to resist the excessive strain thrown upon the alveoli of the molar teeth. He exhibited the mandibles to Prof. H.E. Friesell, Dean of the Dental Faculty, University of Pittsburg, and this authority concurred in the opinion expressed above."

25: Cameron--55
116, 141

(1913-18) 1923

Copper Eskimo

"The writer has made a routine practice in his anatomy course of referring to a faint groove for the lingual nerve on the inner aspect of the mandible immediately below the last molar tooth, and has always expressed surprise that this is not described in standard textbooks of anatomy. These Eskimo mandibles all exhibited this important groove, which, indeed, was present in some cases to a pronounced degree. He would, therefore, put forward a plea for a fuller recognition of the clinical importance of this groove, seeing that there exists by no means a remote possibility of the lingual nerve being lacerated in a clumsy extraction of the third molar tooth."

"The rami, in conformity with the bodies of the mandibles, were very massively developed and exhibited strong muscle markings. The author decided to experiment with a new index for the ramus to be termed 'the index of width of the ramus.' To obtain this the width was multiplied by 100 and divided by the height. The length was measured from the bottom of the sigmoid notch to the lower border of the ramus in a direction parallel to the anterior and posterior borders. The width was measured from the centre of the slightly concavity in the anterior border below the coronoid process and at right angles to the borders. The lines representing the length and width of each ramus thus intersected at right angles. It was found that the measurements varied for the right and left rami of each mandible except in one case. Thus in half the cases the right ramus was the wider, while in the others the left exhibited the greater relative width, suggesting varying masticatory habits of these individuals. The index of course indicated the proportion which the width of the ramus bore to its length. It was found to vary from 93.02 to 68.6, and, moreover, exhibited one consistent feature, namely--it increased with age in both sexes, up to middle life at any rate. There were no aged mandibles to illustrate the condition of the index in late life. The interpretation of these results obfiously was, that the width of the Eskimo ramus increased with age in both sexes up to middle life. On studying this index in ten adult Anglo-Saxon mandibles, the maximum and minimum

figures were 67.8 and 52.3, which were much below the Eskimo averages, thus demonstrating that the Eskimo ramus was relatively much wider than the Anglo-Saxon. On studying this matter further in European types of mandible, it was ascertained that the index of width of the ramus increased with age so long as the teeth remained intact, and then diminished again if the individual became edentulous. Altogether this comparative study of these Eskimo mandibles provided some gratifying and suggestive results.

The mandibular condyles were so placed that their long axes converged upon the centre of the anterior edge of the foramen magnum as in the European type. Their articular surfaces were, however, slightly flatter in conformation with the more shallow character of the Eskimo glenoid fossae."

"The Scapula

"There was only one scapula in a sufficient state of repair for the estimation of its index. This proved to be 72.4. Duckworth (10) gives an average scapular index of 61

10. Duckworth, L. W. H. Morphology and Anthropology. Cambridge, 1904.

for the Eskimo, so that it is evident there is a wide range of racial variation. The same observer gives 65.3 as the average European scapular index. The writer (19) found

19. Cameron, J. Tomb of Two Brothers, Report on the Anatomy of the Mummies. Manchester University Museum Handbook No. 68, 1910.

indices of 69.1 and 71.2 in the scapulae of two ancient Egyptian princes of the XIIth Dynasty. It may be noted that the higher the index, the more simian is the scapula."

"The Humerus

The writer found perforation of the olecranon fossa in one out of ten adult humeri. These exhibited no trace of a supracondyloid process.

The Innominate Bone

There were only two innominate bones (XIV D-7 and XIV F-1) sufficiently intact to permit of the estimation of their indices. These were 76.2 and 74, with an average of 75.1. Duckworth (10) gives indices 87 and 89 for two Eskimo skeletons, so that we

10. Duckworth, L. W. H. Morphology and Anthropology. Cambridge, 1904.

recognize once more an extensive range of racial variation for this index. In white races it was found to vary from 74.5 to 79.1. The lower the index, the more simian is the type of innominate bone."

"The Femur

All the femora, without exception, exhibited the forwardly directed convexity of their shafts associated with the characteristic pilastered condition of the linea aspera, which is so prevalent in races that habitually squat. The neck of the femur was relatively short in comparison with the Anglo-Saxon type, but joined the shaft at about the same angle. In four out of six cases the squatting facet was present on the anterior aspect of the femoral neck.

The stature was estimated from the lengths of the femora, using the proportion .275 as given by Thane, (1) and was found to vary from 161.2 cm. in a male to 140.3 cm. in a female. The average stature for the Eskimo male is given as 162.1 cm. by Deniker. (2)

1. Berry, J.A., and Robertson, A.W.D. The Place in Nature of the Tasmanian Aboriginal. Proceedings of the Royal Society of Edinburgh, Vols. 31 and 34, 1910 and 1913.

2. Brierley, J., and Parsons, F.G. Notes on a Collection of Ancient Eskimo Skulls. Journal of the Royal Anthropological Institute, Vol. XXXVI, London, 1906.

The index of platymeria was taken on the bone at the level where the buttress descending from the small trochanter fades away on the posterior aspect of the shaft. The index varied from 101.6 to 80.9, so that practically no tendency to flattening of the shaft of the femur existed in these skeletons."

"The Tibia

The upper ends exhibited varying degrees of retroversion, as found in races that habitually squat; but this was not nearly so pronounced as in two skeletons from Ancient Egypt described by the writer. (19) Moreover, there were no squatting facets on the

19. Cameron, J. Tomb of Two Brothers, Report on the Anatomy of the Mummies. Manchester University Museum Handbook No. 68, 1910.

lower ends of the tibiae, nor on the necks of the astragali. This provides us with a hint as to the exact squatting posture adopted by the individual, for it is evident that the Eskimos squatted with their buttocks still resting on the ground, while in the East we find the more extreme degree where the buttocks rest upon the heels. The latter is therefore associated with the most extreme condition of flexion of the hip, knee and ankle joints, thus producing facets on the neck of the femur, the lower end of the tibia and the neck of the astragalus, together with marked retroversion of the upper end of the tibia, a pilastered femur and platycnemia of the tibial shaft."

25: Cameron--56-57 (1913-18) 1923 Copper Eskimo-2
116, 141

"The index of platycnemia of these Eskimo tibiae varied from 76.4 to 65.6. These were well below the European average of 88.2, (10) but did not represent the extreme degree of platycnemia displayed by the two ancient Egyptian skeletons referred to above, where the indices were as low as 57.5 and 56.2."

25: Cameron--57 (1913-18) 1923 Copper Eskimo
116, 141

"The Intermembral Index

Owing to the wholesale destruction of the limb bones by wild animals, this index could be estimated in only two (male) skeletons. For these the figures were 70.6 and 70.2, which were in the vicinity of the Eskimo average of 73.4 given by Duckworth (10) (for

10. Duckworth, L. W. H. Morphology and Anthropology. Cambridge, 1904.

two skeletons). It may be observed that this index is always over 100 in the anthropoid apes, owing to the greater length of the upper limb in these animal types. In man, however, owing to the preponderating length of the lower limbs, the index falls considerably below 100, and it is interesting to note that in modern Hominidae (with the exception of the Bambute pygmies) the index shows a very slight inter-racial variation, being closely in the vicinity of 70."

25: Cameron--57 [2] (1913-18) Copper Eskimo
116, 141

"The Radio-Humeral Index

This index was 68.03 and 74.02 in the two Eskimo skeletons. The race is usually in the brachy-kerkic group of Turner (18) with an index under 75, so that the two above

18. Turner, Sir William. Report on the Bones of the Human Skeleton. Challenger Reports, Vol. 16, Part 47. London 1886.

examples conform to this grouping, which also includes the European type. The index, of course, demonstrated that the radius is relatively short in the Eskimo, and this places him in the group furthest away from the simian type. The writer (19) found radio-humeral

19. Cameron, J. Tomb of Two Brothers, Report on the Anatomy of the Mummies. Manchester University Museum Handbook No. 68, 1910.

indices of 78.6 and 81.3 in two ancient Egyptian male skeletons."

"The Tibio-Femoral Index

This was 80.7 and 81.8 in these two skeletons. The indices were thus below 83, and placed them in the brachycnemic category in which Eskimos are usually grouped with Europeans and most of the yellow races. Tibio-femoral indices of 83.4 and 82.7 were recorded by the writer (19) in two ancient Egyptian skeletons, which therefore closely

19. Cameron, J. Tomb of Two Brothers, Report on the Anatomy of the Mummies. Manchester University Museum Handbook No. 68, 1910.

approximated to the above figures."

"The Humero-Femoral Index

This was 75.9 and 73.4 in the two cases. These are decidedly below the Eskimo average of 77.7 given by Turner. (18) Duckworth (10) challenges Turner's assertion that

18. Turner, Sir William. Report on the Bones of the Human Skeleton. Challenger Reports, Vol. 16, Part 47. London, 1886.

10. Duckworth, L. W. H. Morphology and Anthropology. Cambridge, 1904.

the Eskimos are amongst the most simian of modern races so far as this index is concerned and these two results, scanty as they are, give support to this challenge. Humero-femoral indices of 68.8 and 71.2 were found by the writer (19) in two ancient Egyptian

19. Cameron, J. Tomb of Two Brothers, Report on the Anatomy of the Mummies. Manchester University Museum Handbook No. 68, 1910.

skeletons, which thus approximated to the Anglo-Saxon average of 71.

In concluding, the author desires to place on record his appreciation of the assistance of his Demonstrator, Dr. Gerald Grant, and of his senior students Clarence G. Campbell, B.A., and Howard A. Creighton, B.A., in the calculation of the various cranial

measurements and indices. We worked in couples and then checked our individual results so as to make the records as accurate as possible. Our task was no light one, as thousands of calculations and measurements had to be made. However, we trust that by these means the possibility of error has been reduced to a minimum.

It gave me much gratification to be able to secure the services of Dr. S. G. Ritchie and Dr. J. Stanley Bagnall, Dalhousie University Dental School, for the report upon the dentition. They had a free hand in the matter, and have assumed full responsibility for that section of the publication."